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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/844,567	04/27/2001	Michael Strano	UD00-04 (131*206)	1791

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EXAMINER

MENON, KRISHNAN S

ART UNIT	PAPER NUMBER
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1723

DATE MAILED: 09/26/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

09/844,567

STRANO ET AL.

Examiner

Art Unit

Krishnan S Menon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 14-37 is/are rejected.
- 7) ☒ Claim(s) 9-13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Claim Rejections - 35 USC § 112***

Claims 3,5,6 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 3,5 and 20, the phrase "from about" renders the claim(s) indefinite. A range from x to y denote values from x to y, and the term about x signifies values of x a little below to a little above x. However, the term "from about x to y" renders the scope of the claim(s) unascertainable. See MPEP § 2173.05(d). Similarly, the phrase "between from" renders claim 20 unascertainable.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1,3-6, 14-17, 22, 24, 26, and 32-37 rejected under 35 U.S.C. 102(b) as being clearly anticipated by Rao et al (US 5,104,425).

Rao (425) discloses a carbon membrane comprising a support having through pores, a carbon material attached to the pores filling a portion of the pores (instant claim 1, 32, 34) (col 8: 55-65); support pore size 0.1 to 50 microns (instant claim 3,4, 16,17, 22, 34) (col 9: 5-20); membrane pore size (instant claim 5,6, 16,17, 24,33-37) between 1 and 10 nm (col 8: 10-18); membrane is

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tubular or flat disc (instant claim 14, 15) (col 9: 1-16); mesocarbon material in the pores (instant claim 16, 17, 26,34) (col 10: 37-63); and carbon attached to one surface (instant claim 32) (col 9: 4-19) with the carbon material partially filling the pores (col 10: 37-63).

2. Claims 1,2,8,16,21,22, 24, 28 and 29 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Foley et al (US 5,972,079).

Foley et al (079) discloses a carbon membrane supported on a porous stainless steel (instant claim 1,2,16) with the carbon partially filling the pores (col 5 lines 35-55); operating temperature > 200C (instant claim 8) (col 10: 5-35); porous stainless steel support inherently rigid (instant claim 21) having porosity 0.1 to 100 microns (instant claim 16) (col 2: 54-65); pore size in the range of 30-100 nm (instant claim 16,22, 24) (col 2: 54-65). The membrane of Foley (079) has the inherent use for liquids like hydrocarbons as in instant claim 28 and 29, similar to gaseous hydrocarbons like methane (Figure 12) and can be used in the form of one or more tubes (instant claim 29) col 5 line 64-col 6 line 14).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 7, 18-20, 23,25, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foley et al(079) in view of Lafyatis, et al (Ind.Eng.Chem.Res. **1991**, 30, 865-873).

Foley et al (079) discloses a mesoporous carbon molecular sieve membrane supported on a porous stainless steel (instant claim 7,16, 27,30) with the carbon partially filling the pores (col 5 lines 35-55); porous stainless steel support having porosity 0.1 to 100 microns (instant claim 16) (col 2: 54-65); pore size in the range of 30-100 nm (instant claim 16,18) (col 2: 54-65); made by applying a carbonizing polymer precursor to the pore walls of the support to partially fill the through pores and pyrolyzing the coating to form the membrane in an inert atmosphere (instant claim 18, 27, 30) (col 5: 35-55); the carbonizing polymer is poly furfuryl alcohol (instant claim 19) (col 1: 50-67).

Foley (079) does not disclose operating pressure of 1000 psig (instant claim 7), the non-carbonizing template polymer poly ethylene glycol (instant claim 18 – 20, 27, 30), and the pores in the mesoporous mode being in the range of 1-10 nm. Lafyatis et al (Ind.Eng.Chem.Res. **1991**) teach mesoporous carbon molecular sieve having pyrolyzed poly furfuryl alcohol and poly ethylene glycol (para 3, col 2, page 865), proportion of PEG to PFA as 25:75 (instant claim 19, 20) (col 2 para 1, page 866), pore size could be controlled by varying PEG mol weight (instant claim 30) (col 1, page 869), the PFA/PEG material has both microporous and mesoporous regions (conclusion, page 872) with pore size distribution for the mesoporous region below 10 nm (instant claim 23, 25) (fig 8). It

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would be obvious to one of ordinary skill in the art at the time of invention to use the teachings of Lafyatis et al (Ind.Eng.Chem.Res. **1991**) in the molecular sieve carbon membrane as taught by Foley(079) as alternate but equivalent to the membrane as taught by Foley (079) for equivalent function. It would also be obvious to one of ordinary skill in the art at the time of invention that the operating pressure of the membrane could be designed to over a thousand psig for the Foley (079) membrane (as in instant claim 7), since the membrane is supported by porous stainless steel which inherently takes very high pressure, and the operating pressure could be designed in using standard engineering practice.

2. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Foley et al(079) in view of Lafyatis, et al (Ind.Eng.Chem.Res. **1991**, 30, 865-873) as applied to claim 30 above, and further in view of Foley (Microporous materials 4, **1995**, 407-433).

Foley et al(079) in view of Lafyatis, et al (Ind.Eng.Chem.Res. **1991**, 30, 865-873) discloses a carbon molecular sieve membrane as in claim 30 above. However, Foley et al(079) in view of Lafyatis, et al (Ind.Eng.Chem.Res. **1991**, 30, 865-873) does not state that the porosity can be varied by varying the proportion of PEG. Foley (Microporous materials 1995) teaches that the pore size can be varied by varying the amount of PEG (col 1 para 3 page 422). It would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Foley (Microporous materials 1995) in the teaching of Foley et al(079) in view of Lafyatis, et al (Ind.Eng.Chem.Res. **1991**, 30, 865-873) to have varied pore size in the membrane as alternate but equivalent for equivalent function.

3. Claims 9-13, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foley et al (US 5,972,079).

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Foley et al (079) discloses a carbon membrane supported on a porous stainless steel (instant claim 1,2,16) with the carbon partially filling the pores (col 5 lines 35-55), and it can be in the form of one or more tubes (instant claim 29) (col 2 lines 40-45). Foley (079) does not disclose that the membrane has a water permeance as given in instant claim 9 or BSA rejection as in instant claim 10-13. However, it would be obvious to one of ordinary skill in the art at the time of invention that the Foley (079) membrane also could have similar water flux or BSA rejection as in the membrane of the instant claims 9-13, since the Foley (079) membrane is similar to the membrane of the instant claims 9-13. Foley (079) also does not disclose a process for separating a substance in a liquid comprising filtering the liquid through the supported mesoporous carbon membrane. It would be obvious to one of ordinary skill in the membrane separation process art at the time of invention to make a process of separating a substance from a liquid by passing the liquid through a supported mesoporous carbon membrane as recited in claim 28 and one of ordinary skill in the art could use the Foley membrane in that process as equivalent membrane for an equivalent function.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Anand et al (US 5,435,836), Soffer (US 4,685,940) and Linder (US 5,028,337) also disclose carbon molecular sieve membranes with or without supports.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krishnan S Menon whose telephone number is 703-305-5999. The examiner can normally be reached on 8:00-4:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L Walker can be reached on 703-308-0457. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Krishnan S. Menon
Patent Examiner
September 17, 2002


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